

CLAIMS

WHAT IS CLAIMED IS:

1. An interlock/exclusion system for use with an gas administration apparatus having at least a first, second and third gas flow units removably secured thereto, each of the gas flow units being arranged to be opened to enable the apparatus to provide a gas to a patient, said interlock/exclusion system being arranged when any one of the gas flow units is opened to prevent the opening of the others of the gas flow units, said interlock/exclusion system comprising a first pivotable bar, a second pivotable bar, a first pivotable coupling, a first pin associated with said first bar and with the first gas flow unit, a second pin associated with said first and second bars and said second gas flow unit, a third pin associated with said second bar and said third gas flow unit, said first pivotable bar having a first end to which said first pin is coupled and a second end to which said second pin is coupled, said second pivotable bar having a first end to which said second pin is coupled and a second end to which said third pin is coupled, said first coupling having a first portion arranged to engage said second end of said first pivotable bar and a second portion arranged to engage said first end of said second pivotable bar, said first gas flow unit being arranged when opened to cause said first pin to pivot said first pivotable bar, whereupon said second end of said first pivotable bar causes said second pin to prevent the opening of said second gas flow unit and causes said first coupling to pivot to cause said second pivotable bar to pivot, whereupon said second end of said second pivotable bar causes said third pin to prevent the opening of said third gas flow unit, said second gas flow unit being arranged when opened to cause said second pin to pivot said first and second pivotable bars, whereupon said first end of said first pivotable bar causes said first pin to prevent the opening of said first gas flow unit and said second end of said second pivotable bar causes said third pin to prevent the opening of said third gas flow unit, said third gas flow unit being arranged when opened

to cause said third pin to pivot said second pivotable bar, whereupon said first end of said second pivotable bar causes said second pin to prevent the opening of said second gas flow unit and causes said first coupling to pivot to cause said first pivotable bar to pivot, whereupon said first end of said first pivotable bar causes said first pin to prevent the opening of said first gas flow unit.

5 2. The interlock/exclusion system of Claim 1 wherein each of said pivotable bars is an elongated member having an intermediate pivot point located between its first end and its second end.

10 3. The interlock/exclusion system of Claim 2 wherein said first coupling comprises a pivotable member having an opposed pair of hooks projecting from opposite sides of a pivot point, one of said hooks being arranged to releasably engage said second end of said first pivotable bar, the other of said hooks being arranged to releasably engage said first end of said second pivotable bar.

15 4. The interlock/exclusion system of Claim 3 wherein said first coupling is a generally T-shaped member, whose pivot point is located between and below said second end of said first pivotable bar and said first end of said second pivotable bar.

20 5. The interlock/exclusion system of Claim 1 wherein the gas administration apparatus includes a fourth gas flow unit and wherein said interlock/exclusion system additionally comprises a third pivotable bar, a second pivotable coupling, and a fourth pin, said fourth pin being associated with said third pivotable bar and with said fourth gas flow unit, said third pivotable bar having a first end to which said third pin is coupled and a second end to which said fourth pin is coupled, said second coupling having a first portion arranged to engage said second end of said second pivotable bar and a second portion arranged to engage said first end of said third pivotable bar, said fourth gas flow unit being arranged when opened to cause said fourth pin to pivot said third pivotable bar, whereupon said first end of said third pivotable bar causes said third pin to

prevent the opening of said third gas flow unit and causes said second coupling to pivot to cause said second pivotable bar to pivot, whereupon said first end of said second pivotable bar causes said second pin to prevent the opening of said second gas flow unit, and causes said first coupling to pivot to cause said first pivotable bar to pivot, whereupon said first end of said first pivotable bar causes said first pin to prevent the opening of said first gas flow unit.

6. The interlock/exclusion system of Claim 5 wherein each of said pivotable bars is an elongated member having an intermediate pivot point located between its first end and its second end.

7. The interlock/exclusion system of Claim 6 wherein said first coupling comprises a pivotable member having an opposed pair of hooks projecting from opposite sides of a pivot point, one of said hooks of said first coupling being arranged to releasably engage said second end of said first pivotable bar, the other of said hooks of said first coupling being arranged to releasably engage said first end of said second pivotable bar and wherein said second coupling comprises a pivotable member having an opposed pair of hooks projecting from opposite sides of a pivot point, one of said hooks of said second coupling being arranged to releasably engage said second end of said second pivotable bar, the other of said hooks of said second coupling being arranged to releasably engage said first end of said third pivotable bar.

8. The interlock/exclusion system of Claim 7 wherein said first coupling is a generally T-shaped member, whose pivot point is located between and below said second end of said first bar and said first end of said second bar, and wherein said second coupling is a generally T-shaped member, whose pivot point is located between and below said second end of said second bar and said first end of said third bar.

9. The interlock/exclusion system of Claim 1 wherein each of the gas flow units includes a rotatable cap having a recess in its periphery, each of the recesses including a cam surface,

and wherein said first, second and third pins are adapted to enter into an associated one of said recesses.

10. The interlock/exclusion system of Claim 9 additionally comprising first, second and third intermediate members, said first intermediate member being arranged to be engaged by said first end of said first pivotable bar and being coupled to said first pin, said second intermediate member being arranged to be engaged by said first end of said second pivotable bar and said second end of said first pivotable bar, said second intermediate member being coupled to said second pin, said third intermediate member being arranged to be engaged by said second end of said second pivotable bar and being coupled to said third pin.

15. The interlock/exclusion system of Claim 10 wherein each of said first, second and third intermediate members is oriented vertically, wherein each of said first second and third pins is oriented for generally vertical reciprocation, and wherein each of said recesses is located on an undersurface of the cap of the associated gas flow unit for receipt of a respective one of said first, second and third pins therein.

20. The interlock/exclusion system of Claim 11 wherein each of said pivotable bars is an elongated member having an intermediate pivot point located between its first end and its second end.

25. The interlock/exclusion system of Claim 12 wherein said first coupling comprises a pivotable member having an opposed pair of hooks projecting from opposite sides of a pivot point, one of said hooks being arranged to releasably engage said second end of said first pivotable bar, the other of said hooks being arranged to releasably engage said first end of said second pivotable bar.

30. The interlock/exclusion system of Claim 13 where said first coupling is a generally T-shaped member, whose pivot point is located between and below said second end of said first pivotable bar and said first end of said second pivotable bar.

35. The interlock/exclusion system of Claim 11 wherein said first, second and third pins are laterally offset from said

first, second, and third intermediate members, respectively, and wherein said interlock/exclusion system additionally comprises a first lever coupled between said first pin and said first intermediate member, a second lever coupled between said second pin and said second intermediate member, and a third lever coupled between said third pin and said third intermediate member.

16. The interlock/exclusion system of Claim 15 wherein each of said pivotable bars is an elongated member having an intermediate pivot point located between its first end and its second end.

17. The interlock/exclusion system of Claim 16 wherein said first coupling comprises a pivotable member having an opposed pair of hooks projecting from opposite sides of a pivot point, one of said hooks being arranged to releasably engage said second end of said first pivotable bar, the other of said hooks being arranged to releasably engage said first end of said second pivotable bar.

18. The interlock/exclusion system of Claim 17 where said first coupling is a generally T-shaped member, whose pivot point is located between and below said second end of said first pivotable bar and said first end of said second pivotable bar.

19. An gas administration apparatus having at least a first, second and third gas flow units removably secured thereto and an interlock/exclusion system, each of said gas flow units being arranged to be opened to enable the apparatus to provide a gas to a patient, said interlock/exclusion system being arranged when any one of said gas flow units is opened to prevent the opening of the others of said gas flow units, said interlock/exclusion system comprising a first pivotable bar, a second pivotable bar, a first pivotable coupling, a first pin associated with said first pivotable bar and with said first gas flow unit, a second pin associated with said first and second pivotable bars and said second gas flow unit, a third pin associated with said second pivotable bar and said third gas flow unit, said first pivotable bar having a first end to which

5 said first pin is coupled and a second end to which said second
pin is coupled, said second pivotable bar having a first end to
which said second pin is coupled and a second end to which said
third pin is coupled, said first coupling having a first portion
10 arranged to engage said second end of said first pivotable bar
and a second portion arranged to engage said first end of said
second pivotable bar, said first gas flow unit being arranged
when opened to cause said first pin to pivot said first
15 pivotable bar, whereupon said second end of said first pivotable
bar causes said second pin to prevent the opening of said second
gas flow unit and causes said first coupling to pivot to cause
said second pivotable bar to pivot, whereupon said second end of
said second pivotable bar causes said third pin to prevent the
opening of said third gas flow unit, said second gas flow being
20 arranged when opened to cause said second pin to pivot said
first and second pivotable bars, whereupon said first end of
said first pivotable bar causes said first pin to prevent the
opening of said second gas flow unit and said second end of said
second pivotable bar causes said third pin to prevent the
25 opening of said third gas flow unit, said third gas flow unit
being arranged when opened to cause said third pin to pivot said
second pivotable bar, whereupon said first end of said second
pivotable bar causes said second pin to prevent the opening of
said second gas flow unit and causes said first coupling to
pivot to cause said first pivotable bar to pivot, whereupon said
first end of said first pivotable bar causes said first pin to
prevent the opening of said first gas flow unit.

30 20. The gas administration apparatus of Claim 19 wherein
each of said pivotable bars is an elongated member having an
intermediate pivot point located between its first end and its
second end.

35 21. The gas administration apparatus of Claim 20 wherein
said first coupling comprises a pivotable member having an
opposed pair of hooks projecting from opposite sides of a pivot
point, one of said hooks being arranged to releasably engage
said second end of said first pivotable bar, the other of said

hooks being arranged to releasably engage said first end of said second pivotable bar.

22. The gas administration apparatus of Claim 21 where said first coupling is a generally T-shaped member, whose pivot point is located between and below said second end of said first pivotable bar and said first end of said second pivotable bar.

23. The gas administration apparatus of Claim 19 wherein the gas administration apparatus includes a fourth gas flow unit and wherein said interlock/exclusion system additionally comprises a third pivotable bar, a second pivotal coupling, and a fourth pin, said fourth pin being associated with said third pivotable bar and with said fourth gas flow unit, said third pivotable bar having a first end to which said third pin is coupled and a second end to which said fourth pin is coupled, said second coupling having a first portion arranged to engage said second end of said second pivotable bar and a second portion arranged to engage said first end of said third pivotable bar, said fourth gas flow unit being arranged when opened to cause said fourth pin to pivot said third pivotable bar, whereupon said first end of said third pivotable bar causes said third pin to prevent the opening of said third gas flow unit and causes said second coupling to pivot to cause said second pivotable bar to pivot, whereupon said first end of said second pivotable bar causes said second pin to prevent the opening of said second gas flow unit, and causes said first coupling to pivot to cause said first pivotable bar to pivot, whereupon said first end of said first pivotable bar causes said first pin to prevent the opening of said first gas flow unit.

24. The anesthesia of Claim 19 wherein each of the gas flow units includes a rotatable cap having a recess in its periphery, each of the recesses including a cam surface, and wherein said first, second and third pins are adapted to enter into an associated one of said recesses.

25. The gas administration apparatus of Claim 24 additionally comprising first, second and third intermediate members, said first intermediate member arranged to be engaged

by said first end of said first pivotable bar and being coupled to said first pin, said second intermediate member arranged to be engaged by said first end of said second pivotable bar and said second end of said first pivotable bar, said second intermediate member being coupled to said second pin, said third intermediate member arranged to be engaged by said second end of said second pivotable bar and being coupled to said third pin.

26. The gas administration apparatus of Claim 25 wherein each of said first, second and third intermediate members is oriented vertically, wherein each of said first second and third pins is oriented for generally vertical reciprocation, and wherein each of said recesses is located on an undersurface of the cap of the associated gas flow unit for receipt of a respective one of said first, second and third pins therein.

27. The gas administration apparatus of Claim 26 wherein said first, second and third pins are laterally offset from said first, second, and third intermediate members, respectively, and wherein said interlock/exclusion system additionally comprises a first lever coupled between said first pin and said first intermediate member, a second lever coupled between said second pin and said second intermediate member, and a third lever coupled between said third pin and said third intermediate member.